

Frequently Asked Questions:

Digital Manufacturing and Design Innovation (DMDI) Institute and Lightweight and Modern Metals Manufacturing Innovation (LM3I) Institute (Feb. 25, 2014)

- 1. How much federal funding will go into each of the two new manufacturing innovation institutes?**
 - Each institute's federal funding contribution will be about \$70 million across the five years of the cooperative agreement period of performance. Consistent with the President's broader proposal, the Institutes will be supported with federal funding through the start-up and initial operational phases, after which they are expected to become fiscally self-sustaining.
 - Each manufacturing innovation institute solicitation required that applicants match the federal investment on no less than a 1:1 basis.
- 2. How much cost share was received for each institute?**
 - The cost share from both awardees surpassed the 1:1 minimum requirement, with the Digital Manufacturing and Design Innovation (DMDI) Institute cost share substantially exceeding the 1:1 minimum.
- 3. With declining budgets can DoD afford to use its resources to establish these institutes?**
 - Yes, this is a matter of funding our highest defense and national priorities. The DoD is already investing in critical additive manufacturing, lightweight and modern metals manufacturing, and digital manufacturing and design needs. Engaging in sustainable public-private partnerships that build strong innovation capacity around these manufacturing technologies is our chosen investment strategy. We know that defense requirements alone are often insufficient to underpin the development, growth and sustainment of emerging industries needed to produce leading edge defense systems. We need a vibrant domestic commercial base in these areas as well, and these public-private manufacturing research partnerships will provide that capability. We also leverage other planned federal investments in these technologies. NASA will run several prizes and challenges through both the digital and additive manufacturing DoD-led institutes. Additionally, the National Institute of Standards and Technology is committed to partnering with DoD for the development of data standards and architecture in support of the LM3I Institute.
- 4. What happens after the five years of federal funding and the Cooperative Agreement is concluded? What will be the government role be at that time?**
 - While the Cooperative Agreement concludes at the end of the five years, the government hopes to continue to be a customer of the institutes. This could include specific project funding applied to the institute(s) from a variety of federal agencies.
- 5. What is the length of the Cooperative Agreement for each DoD-led institute?**
 - The Cooperative Agreement for both the DMDI and LM3I Institutes will be for a period of five years.
- 6. What other agencies are contributing to the DoD-led institutes?**

- Currently, the Departments of Commerce and Energy, the National Science Foundation, and NASA are partners in the DoD-led institutes. There is continuing development of partnership opportunities with other agencies based on their mission requirements in these technology focus areas.

7. Who will lead each of the DoD institutes?

- The DMDI Institute will be overseen by the Office of the Secretary of Defense (OSD) and managed by the US Army Research and Development Command. The LM3I Institute will be overseen by OSD, and managed by the Office of Naval Research.
- Component and interagency partners will support the technical advisory board of each Institute. These boards will be solicited through and supported by a tri-service, interagency group composed of members from contributing agencies.

8. What will be the role of the DoD in the management of the Institutes?

- The Department's overarching roles are to stand-up individual Institutes through federal acquisitions (including the provisioning of federal funding) and provide oversight and stewardship of federal funds. DoD will also contribute its technical advice and assistance through participation on an advisory board. Each Institute will have substantial autonomy from its partner organizations and institutions and will have an independent fiduciary board of directors predominantly composed of industry representatives. An Institute leader such as an executive director will be in charge of day-to-day operations.

9. What will the Digital Manufacturing and Design Innovation Institute focus on?

- The goal of the Digital Manufacturing and Design Innovation (DMDII) Institute is to accelerate research, development, and demonstration in the integration of Advanced Manufacturing Enterprise, Intelligent Machines, and Advanced Analysis in a secure and trusted cyber physical system. The DMDI Institute will serve as a technical center of excellence, providing the innovation infrastructure to support manufacturing enterprises of all sizes. The expected outcomes of the Institute are: an increase in the successful transition of digital manufacturing and innovative design technologies through advanced manufacturing; the creation of an adaptive workforce capable of meeting industry needs; further increases in domestic competitiveness; and the fulfillment of participating defense and civilian agency requirements.

10. What will the Lightweight and Modern Metals Manufacturing Innovation Institute focus on?

- The focus of the LM3I Institute will be two-fold: first, maturing and demonstrating commercial and defense market potential of existing, innovative, lightweight alloys, and second, developing more affordable, competitive, automated manufacturing processes to promote energy efficiency. The hyper-competitive global marketplace for metals has created a paradox for the lightweight modern metals industry: it can continue to invest in technology that promotes cost competitiveness and global market share against developing economies, or it can invest in new alloys that promote market expansion based upon the demand of new consumers of lightweight products. To compete, U.S. industry has been forced to choose efficiency over expansion, which has resulted in a significant reduction in new lightweight metals. A cottage industry of small and non-traditional (research) companies has emerged and introduced a third generation of lightweight metals, which are not being effectively utilized because of scale-up challenges and a lack of design guides and certifications.

- The LM3I Institute will work in collaboration with industry, academia, and government partners to promote market expansion, and to attract new consumers of lightweight products where modern metals can be matured, scaled up and made available to industry partners, including those in the automotive, aerospace, defense, and energy sectors. At the same time, the institute will continue to maintain global cost competitiveness by seeking greater efficiency in critical manufacturing processes such as electrolytic reduction, melt practice, and other production processes impacting cost.

11. What is the Digital Thread (DMDI)?

- The “digital thread” describes the concept of capturing and utilizing digital data and information, generated from the initial concept development and design. This information is used to support analysis, planning, manufacturing, assembly, maintainability, and disposal. It provides a fundamentally new way for digital information to securely flow between suppliers and customers, to and from intelligent machines and workers on the shop floor, and through supply chains. This will result in an efficient and competitive domestic manufacturing base. A digital thread provides an open, interoperable architecture and data model that allows manufacturers and designers of organizations of all sizes to use software tools of their choice while collaborating on design and manufacturing. It is capable of allowing large data sets to be linked across the technology thrusts of advanced manufacturing enterprise, intelligent machines, and advanced analysis.

12. What do you mean by the term Intelligent Machines (DMDI)?

- An intelligent machine is a single device, or a set of devices, comprised of the following: an interoperable framework of hardware, sensors, and software solutions that support heuristic-based process planning; adaptive control; decision making; and management of manufacturing processes across the platform. It is designed to provide an optimal solution while meeting customer requirements, such as form, fit and function.

13. What is ICME (LM3I)?

- Integrated computational materials engineering (ICME) is a nascent discipline that offers a revolutionary capability for the development and introduction of new materials in time frames consistent with system design and engineering. It is an approach for transmitting the knowledge base of materials research in a format that enables engineers and product designers to tailor materials properties and to exploit fully new materials, in the context of their specific applications. This medium integrates multiple computational models that inform the full spectrum of component design, including materials selection, processing and manufacturing, certification, and cost analysis. By allowing for the concurrent design of the product, the material, and the manufacturing scheme – and simultaneous optimization of each – practitioners can reduce design time and cost on the order of 50%. This enables innovative approaches to the use of new materials in advanced products, and allows designers to exceed the expectations of the customer.

14. What will become of America Makes, the National Additive Manufacturing Innovation Institute (NAMII)? Will it be funded to the level of an NNMI Institute?

- NAMII, now known as America Makes, was established as a pilot institute in parallel with—and to help inform—the development of the broader NNMI. It has not been bound by the design parameters envisioned for the up to 45 Institutes that will comprise the NNMI network. The NAMII cooperative agreement, however, does provide flexibility and contractual ceiling to enable the institute to be scaled-up to the size of a

full NNMI institute. Such a change would be dependent on additional project-related funding provided by interested federal agencies.

15. What would be the proportion of workforce training and development in the total activity of an institute?

- Though the proportion is not fixed, manufacturing innovation institutes will provide educational opportunities to improve and expand the manufacturing workforce, including K-12 programs, internship opportunities, skills certification, community college engagement, university collaboration, graduate studies, post-doctoral studies, and retraining to meet the requirements set forth by each institute's mission.
- Each institute should have a plan to be self-sustaining based on diverse funding sources beginning at Institute formation, and be fully independent of NNMI funds five to seven years after launch. Institutes will have the flexibility to pursue sustainable Institute revenue from a variety of sources, including revenue generated by various forms of workforce training.

16. What is the mix of large, medium and small companies and academia in the institutes?

- Partners in the Institutes include the full range of national, state, and local stakeholders. This includes manufacturing enterprises of all sizes, including startups. In addition, a diverse set of institutions of higher education are included.
- LM3I Institute makeup: The winning Lightweight and Modern Metals Manufacturing Innovation (LM3I) Institute team brings together a consortium of leading companies in a vibrant and entrepreneurial region that can serve as the foundation for ongoing U.S. leadership in this important technology. This coalition includes some of the world's foremost aluminum, titanium, and high strength steel manufacturers, leading materials providers, and critical end-users at universities on the cutting edge of technology development and research. In total, there are 34 companies, 9 universities and labs, and 17 other organizations.
- DMDI Institute makeup: The winning Digital Manufacturing and Design Innovation (DMDI) Institute team oversees a consortium of more than 40 companies and more than 20 academic and local government agencies. This team includes major Defense Department contractors, cutting edge commercial companies, and several small and medium sized manufacturers. In total there are 41 companies, 23 universities and labs, and 11 other organizations.

17. What is the vision for small business involvement? How are small companies able to engage the institutes when they typically do not have the resources to pay very much in dues and/or fees?

- A major goal of an Institute is to support the creation, growth, and expansion of small and medium-size enterprises (SMEs). To that end, each institute will demonstrate meaningful outreach to and engagement with SMEs. Each institute is expected to engage existing intermediaries, centers, and networks to work with and address the needs of SMEs, to the benefit and success of the institute's advanced manufacturing agenda.
- SMEs interested in a broad range of services and an ongoing relationship with the Institute could participate in a tiered membership structure that would minimize barriers to entry and encourage the membership of SMEs in the institute. With this membership level, SMEs participate in setting project priorities, selecting projects,

networking, gaining access to all events, and enjoying intellectual property (IP) access consistent with the IP Plan.

- The DMDI Institute has a tiered membership plan. Specific to SMEs is a Tier 3 membership for which there is a nominal membership fee, or in-kind contributions, or cost-sharing for projects. As a member, the SME makes a commitment to building capacity in digital manufacturing and design.
- Recognizing that upfront investments may pose a challenge for SMEs, the LM3I Institute will adopt a tiered membership approach designed specifically to encourage small business involvement.

18. Will the four Manufacturing Innovation Institutes be networked and, if so, how?

- The agreements signed by each Institute include a requirement to support an effort to form a Pilot Network for Manufacturing Innovation, initially involving the established DoD and DOE-led Manufacturing Innovation Institutes. The Pilot Network is a non-binding partnership initially comprised of: the four funded institutes; the funding agencies supporting each Institute; and other invited federal agencies that are leading efforts in advanced manufacturing innovation. During the course of this agreement, the Pilot Network may grow as new institutes are established. By mid-2014, regular Manufacturing Innovation Institute Pilot Network meetings will commence. The purpose of this interaction is to share best practices, engage in a dialogue about leveraging common Institute activities, and develop common practices across all institutes.

19. Will the DMDI Institute deliver physical products or will everything just be electronic designs and files?

- The nature of digital manufacturing and design makes the outputs of the DMDI Institute different from those of the other Manufacturing Innovation Institutes. A significant effort of the DMDI Institute is focused on acquiring the right data, in the right place, and at the right time in order to manufacture the right part at the right price. The work of the Institute will produce components of networks, digital information flow, and software and hardware outputs.

20. Do you see the DoD requiring the use of 3D data and models in future procurements?

- While there currently is no policy requiring 3D data or models, the defense and non-defense manufacturing communities are adopting digital enterprise at varying pace and capability. The Department has moved forward with a number of 3D modeling initiatives to advance the state-of-the-art, to eliminate technical barriers, and to create a positive business case for use, including by updating Mil-Std 31000. DMDI is an outgrowth of a number of efforts that collectively aim to increase the competitiveness and affordability of defense systems.
- Important aspects of the capabilities infrastructure within the LM3I Institute include the creation, implementation, and management of several key items: engineering design and optimization tools, materials and processing models, and materials data and metadata. Primary objectives of the Institute include: enabling strategic alliances across academia, government, and industry; reinforcing best practices in data and code reuse; and ensuring ready access to the right materials required for advanced manufacturing.

21. Are the institutes open to foreign companies?

- The institutes are designed to provide an opportunity for US companies to be more competitive in the international arena. Domestic companies are eligible to participate as well as all companies with substantial manufacturing operations in the US.

22. Can other companies/universities/organizations join one of the DoD Institutes after award? If so, how does one become a member?

- Membership is open to those organizations with an interest in establishing digital manufacturing and design capabilities as the normal method of operations in the U.S. or who have an interest in manufacturing processes related to lightweight metals. Membership information will be available on the institute websites. Like America Makes, which is headquartered in Ohio but has grown to national inclusion, these two institutes offer opportunities to a broad range of participants.

23. What was the selection process for the DMDI and LM3I Institutes?

- Each of the institutes went through a year-long acquisition process that was fair and open. For each Institute, the goals and criteria were outlined in the Broad Agency Announcement and adhered to through the evaluation phase. The process was highly competitive. Each proposal was evaluated based on the strength of the proposal against the criteria. The best proposal as measured against the criteria was selected. Neither geographic location nor political affiliation was an evaluation criterion and neither was considered in the proposal evaluation.

24. Do other countries have similar programs?

- Many countries have active programs designed to inspire innovation and improve manufacturing. Germany has Fraunhofer Gesellschaft, the United Kingdom has Catapult, France has Carnot, Taiwan has the Industrial Technology Research Institute, Canada has the Industrial Research Assistance Program, and Belgium has IMEC.

25. How are these Manufacturing Innovation Institutes different from the German Fraunhofer?

- The Manufacturing Innovation Institutes have a number of objectives, including the following: forging domestic companies into stronger competitors in the international market; improving the manufacturing landscape in the US; and positively impacting domestic employment. Fraunhofer in Germany has similar objectives, but it consists of a single body running and overseeing 80 institutes world-wide, with 60 in Germany. Each of our Manufacturing Innovation Institutes is run independently by an industry-academia consortium.

By German law, the German government provides one-third of the total budget of the Fraunhofer Institutes every year. In our case, federal funding phases out after five to seven years.

26. Is this activity more aligned to the mission of the Department of Commerce?

- In fact, the Administration envisions the Department of Commerce (DOC) as the agency in charge of the broader NNMI initiative. The DoD and DOE have worked closely with the DoC every step of the way: by developing the initial NNMI blueprint document, creating the Advanced Manufacturing National Program Office housed in the National Institute of Standards and Technology (NIST), and informing DOC about our DoD-led institute stand-up activities. Secretary Hagel met with Secretary Pritzker in November, 2013 to discuss the need for investment in manufacturing and the manufacturing innovation Institutes. The Department of Commerce is providing some of the funding

for these DoD-led Institutes. Both DoD and DoC support the bi-partisan, bi-cameral legislation entitled the “Revitalize American Manufacturing and Innovation (RAMI) Act of 2013” which will provide a \$600 million fund for NIST in order to create a network of Manufacturing Innovation Institutes.

27. Will these institutes create new jobs?

- The institutes will help develop the ability, skills and knowledge it takes to make 21st-century commercial and defense products, given that they are imperative in our nation's security, safety, and prosperity. As existing companies and new companies deploy this knowledge they will create jobs to produce products that can compete in the global market place.